PTO 01-103

Japanese Kokai Patent Application
No. Sho 61[1986]-254040

ROTOR FOR ALTERNATING-CURRENT GENERATOR FOR VEHICLE

Toshiaki Hotta et al.

UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. OCTOBER 2000
TRANSLATED BY THE RALPH MCELROY TRANSLATION COMPANY

JAPANESE PATENT OFFICE
PATENT JOURNAL (A)
KOKAI PATENT APPLICATION NO. SHO 61[1986]-254040

Int. Cl.[4]:	H 02 K 3/52 B 60 R 16/02 H 02 K 19/22
Sequence Nos. for Office Use:	B-7429-5H 2105-3D 8325-5H
Filing No.:	Sho 60[1985]-96229
Filing Date:	May 6, 1985
Publication Date:	November 11, 1986
No. of Inventions:	1 (Total of 6 pages)
Examination Request:	Not filed

ROTOR FOR ALTERNATING-CURRENT GENERATOR FOR VEHICLE

[Sharyo yo koryu hatsudenki no kaitenshi]

Inventors: Toshiaki Hotta et al.

Applicant: Nippon Denso Co., Ltd.

[There are no amendments to this patent.]

Claim

A rotor for an alternating-current generator for a vehicle characterized by the fact that an alternating-current generator for a vehicle consisting of a rotor, in which a pair of Landel [transliteration] type pole cores having several claws are arranged so that they mesh with each other in an alternating fashion and in which an exciting coil is wound inside the above-mentioned pole core, and a stator having teeth arranged in the diameter direction opposed to the rotor, is equipped with a bobbin for winding the above-mentioned exciting coil and a spacer formed of a nonmagnetic material which is formed in a body with the bobbin and in which at least the

peripheral part of the rotor opposite the above-mentioned teeth has a cylindrical shape without projections and recessions in the spaces formed between the above-mentioned claws.

Detailed explanation of the invention

Industrial application field

The present invention pertains to a rotor for an alternating-current generator for a vehicle. In particular, it pertains to a pole core part of a rotor.

Outline of the invention

According to the present invention, in a rotor for an alternating-current generator for a vehicle, a spacer formed in a body with a bobbin for winding an exciting coil of the rotor is inserted into the space between claws of a pole core, and the outer peripheral part of the rotor has a cylindrical shape without projections and recessions. Thus, noise in a high-speed rotation zone due to the interference noise between the pole core and stator is reduced, and the rotation of the bobbin is prevented, so that the exciting coil is prevented from being disconnected and short-circuited.

Prior art

As a conventional rotor for an alternating-current generator for a vehicle, in order to enhance the cooling effect, as described in Japanese Kokai Patent Application No. Sho 58[1983]-79455, a pair of rotor cores, in which several claw-shaped pole core parts projected in an axial direction are formed at the outer peripheral part, have an exciting coil fixed to a yoke inserted into a shaft so that it is sandwiched by the above-mentioned one pair of rotor cores. The pole core parts of the above-mentioned one pair of rotor cores are arranged so that they mesh with each other, and a cooling air passage is formed along the side surfaces of the pole core parts.

Problem to be solved by the invention

Alternator [rotors] have recently been turned at higher speed by raising the pulley ratio in order to achieve small-scale lightness and high output. Along with this, the following two problems have developed from the rotation of Landel type pole cores at high speed.

First, when the pole core is rotated, a centrifugal wind is generated by a fan action of the side surface of the pole core, so that pressure change with pulsation is generated between the stator and the pole core. It interacts with concave and convex parts of the teeth part of the inner periphery of the stator, so that noise like cut wind sound is generated.

Secondly, since the pole core of the rotor and the bobbin for winding the exciting coil are separately formed, when the rotation speed is increased or decreased with high-speed rotation,

the force of inertia is increased. Thereby, a shift between the pole core and the bobbin (rotation of the bobbin) is caused, and excessive tension is exerted on the exciting coil in the bobbin. As a result, the exciting coil can be disconnected and short-circuited.

Accordingly, the present invention considers the above-mentioned problems, and its purpose is to provide a rotor for an alternating-current generator for a vehicle that reduces the cut wind sound in a high-speed rotation zone and prevents an exciting coil from being disconnected and short-circuited.

Means to solve the problem

The present invention is a rotor for an alternating-current generator for a vehicle characterized by the fact that an alternating-current generator for a vehicle consisting of a rotor, in which a pair of Landel type pole cores having several claws are arranged so that they mesh with each other in an alternate fashion and in which an exciting coil is wound inside the above-mentioned pole core, and a stator having teeth arranged in the diameter direction opposed to the rotor, is equipped with a bobbin for winding the above-mentioned exciting coil and a spacer formed of a nonmagnetic material which is formed in a body with the bobbin and in which at least the peripheral part of the rotor opposite the above-mentioned teeth has a cylindrical shape without projections and recessions in the spaces formed between the above-mentioned claws.

Operation of the invention

The space between the claws of the pole core is blocked by a spacer, so that centrifugal wind due to the fan effect of the claw side surface of the pole core is not generated. Also, the space and the bobbin are formed in a body, so that the bobbin and the pole core are prevented from being rotated relative to one another.

Application example

In Figure 9, a pair of frames 9 and 9' being outer shells of a generator are substantially arm shaped, and their opening parts are directly joined and mutually fixed by several pairs of stud bolts 10 and nuts 8 (only one pair is shown in the figure).

At the inner periphery of the above-mentioned frame 9, a stator 2 is pressed in and fixed by the stud bolts 10. The stator 2 consists of a stator core 2-a and a stator coil 2-b wound on the core, and the above-mentioned stator core 2-a has several conventional well-known opening type teeth (magnetic pole teeth) 2-a' (Figure 10) in the inner peripheral direction.

At the center of the side surfaces of the two frames 9 and 9', cylindrical bearing boxes 19 and 19' projected toward the inside of the generator are formed, and bearings 11 and 11' are

respectively installed in the above-mentioned bearing boxes 19 and 19'. A shaft 4 is supported on said two bearings 11 and 11' so that it is freely rotated.

A pair of claw-shaped pole cores 1 and 1' are mechanically fixed to the shaft 4 so that they are positioned inside the above-mentioned stator, and a conventional well-known rotor coil 5 is sandwiched between the above-mentioned pole cores 1 and 1'.

On both side surfaces of the above-mentioned pole cores 1 and 1', centrifugal cooling fans 7 and 7' with a diameter smaller than the inner diameter of the stator are fixed concentrically to the shaft and closely to the pole cores by an appropriate means so that blades 7-a and 7-a' of fans 7 and 7' are opposite the pole cores.

Furthermore, the fans 7 and 7' are of an inclined flow type in which the front of the blades 7-a and 7-a' is inclined in the rotational direction to press the cooling air into the pole cores 1 and 1' in order to cool the rotor coil 5.

On both side surfaces of the above-mentioned one pair of end frames 9 and 9', shrouds (cover) 9-a and 9-a', which play the role of guide plates of the fans opposite them with an appropriate gap to the blades 7-a and 7-a' of the above-mentioned fans 7 and 7'.

Also, suction windows 9-b and 9-b' are formed in the vicinity of the bearings 11 and 11' of both side surfaces of the two end frames 9 and 9' so that cooling air is absorbed into the frames due to the fans 7 and 7', and a discharge window 9-c for discharging hot air after cooling is formed in the part positioned at the outer periphery of the stator coil 2-b. Also, although only 9-c is shown in Figure 1 [sic; 9], there is also a discharge window at the end frame 9'

A pulley 12 arranged outside the end frames 9 and 9' is coupled with the shaft 4 via bearing 11 by a nut 13. Furthermore, the shaft 4 is rotated via the above-mentioned pulley 12 by an engine (not shown in the figure).

At the outside opposite the pulley side of the outer frame formed by the end frames 9 and 9', respective electric function parts of a diode fan 14 equipped with a diode (not shown in the figure), a brush holder 15 for internally holding a brush 15-a which supplies an exciting current to the rotor coil 5, and an IC regulator (not shown in the figure) for adjusting the output voltage are fixed with a rear cover 16 to the frame 9'.

Said rear cover 16 is formed so that it encloses the above-mentioned diode fan 14, brush holder 15, and regulator, and a regulator cooling hole and a diode cooling hole are appropriately opened in the side surface.

Figures 1-3 show the constitution of a bobbin 20 and a spacer 30 respectively formed of an insulating resin. At both ends of the bobbin 20, a collar part 20-a is formed, and from said collar part 20-a, a connecting part 21 with narrowed width is formed in a body at the position opposite the end of a claw 1-p of the pole core 1 and connected to the spacer 30 via a hinge part 22. The spacer 30 consists of a concave part 30-a in contact with a side surface 1-a and a back

face 1-b of the claw 1-p of the pole core 1, curved surface parts 30-b along the outer periphery of the claw 1-p at both sides of the concave part 30-a, and a housing part 30-c with an L-shape curved to the inner peripheral side from the end of the curved surface part 30-b. The same number of spacers 30 as that of claws 1-p of the pole core 1 is formed in a body with the bobbin 20 by the connecting part 21.

Next, the assembly is explained. As shown in Figure 4, the exciting coil 5 is wound on the outer periphery of the bobbin 20. Then, as shown in Figure 5, the spacer 30 is internally bent at the hinge part 22 and inserted into the pole core 1. Then, the claw 1-p of the pole core 1 is fitted to the concave part 30-a of the spacer 30. At that time, as shown in Figure 7, the adjacent housing parts 30-c of the spacer 30 are opposite one another, and a concave part 30-d for fitting a claw 1-p' of the pole core 1' is formed by the pair of adjacent housing parts 30-c. Next, as shown in Figures 6-8, the claw 1-p' of the pole core 1' is fitted to the concave part 30-d formed by a pair of adjacent housing parts 30-c. Then, the bobbin 20 is fixed between the pole cores 1 and 1'. The curved surface parts 30-b of the spacer 30 are arranged in the gap between the claws 1-p and 1-p' of the pole cores 1 and 1', and the outer periphery of the claws 1-p and 1-p' of the pole cores 1 and 1' and the curved surface parts 30-b of the spacer 30 are cylindrical without projections and recessions. Also, the length in the axial direction of the curved surface parts 30-b of the spacer 30 extends such that at least the projections and recessions of the outer periphery of the claws 1-p and 1-p' of the pole cores 1 and 1' of the part opposite the stator teeth 2-a' disappear when they are mounted in the pole cores 1 and 1'. Furthermore, as seen from Figures 5 and 6, a space is formed between the spacer 30 and the exciting coil 5.

Next, the operation of the above-mentioned alternating-current generator for a vehicle is explained. A current is supplied via the brush 15-a and a slip ring to the rotor coil 5, and the rotor coil 5 is rotated via the pulley 12, so that an alternating current is induced in the stator coil 2-b. Then, it is rectified by a rectifier, and the output voltage is controlled by a regulator. Such a power generation system is well known, and its detailed explanation is omitted. Here, the operation unique to the present invention is explained.

If the shaft 5 [sic; 4] is rotated, the cooling fans 7-a and 7-a' of both side surfaces of the pole cores 1 and 1' are rotated, and external cooling air absorbed through the suction windows 9-b and 9-b' cools the bearings 11 and 11', cools the stator coil 2-b, and is discharged as hot air to the outside from the discharge window 9-c. Also, part of the cooling air is pressed into the pole cores 1 and 1', receives the heat from the rotor coil 5, cools the stator coil 2-b, and is discharged as hot air from the discharge window 9-c.

When the above-mentioned cooling air passes through the part of the pole cores 1 and 1', due to recent high-speed operation, a centrifugal wind is generated by the fan action of the side surface 1-a of the pole core claw 1-p, and pressure change is generated with pulsation between

the stator 2 and the pole cores 1 and 1', so that an interference noise is generated by projections and recessions formed by the stator teeth 2-a' and a slot. However, since the curved surface parts 30-b of the spacer 30 are mounted in the space between adjacent pole core claw side surfaces 1-a, the outer periphery of the claws 1-p and 1-p' of the pole core are cylindrical without projections and recessions. Thus, centrifugal wind due to the fan effect of the side surfaces 1-a of the pole core is not generated, and the interference noise from the centrifugal wind and the projections and recessions of the stator teeth 2-a' is not generated.

Also, since the concave part 30-a contacts with the back face 1-b of the claw 1-p of the pole core 1, movement of the spacer 30 due to centrifugal force is prevented.

Also, since there is a gap between the spacer 30 and the exciting coil 5, the cooling air sent between the claws 1-p and 1-p' of the pole cores 1 and 1' by the blade 7-a of the fan 7 at the time of rotation of the rotor can be sent in the axial direction, as is conventional, and the exciting coil 5 can be cooled.

Furthermore, the concave parts 30-a and 30-d of the spacer 30 respectively contact the side surfaces 1-a and 1-a' and the back faces 1-b and 1-b' of the claws 1-p and 1-p' of the pole cores 1 and 1', and the bobbin 20 is formed in a body by the connecting part 21. Thus, the bobbin 20 is moved in a body with the pole cores 1 and 1', so that there is no relative rotation between the bobbin 20 and the pole cores 1 and 1'. Thereby, disconnection and short circuit in the exciting coil 5 wound on the bobbin 20 can be prevented.

Also, since the spacer 30 is mounted in the claws 1-p and 1-p' of the pole cores 1 and 1' by bending the hinge 22, the claws 1-p and 1-p' are pressed against the outer peripheral side, so that vibration in the diameter direction of the claws 1-p and 1-p' is suppressed under the force from spacer 30 expanding toward the outer periphery. Thereby, the resonant sound of the claws 1-p and 1-p' of the pole cores 1 and 1' can also be reduced.

Also, as another application example, as shown in Figures 11 and 12, the spacer 30 may also be formed in an alternate fashion in a body in a pair of collar parts 20a of the bobbin 20 by the connecting part 21.

Effect of the invention

As mentioned above, according to the present invention, with the spacer formed in a body with the bobbin for winding the exciting coil, at least the outer peripheral part of the rotor opposite the teeth of the stator has a cylindrical shape without projections and recessions in the space formed between the claws of the pole core. Thus, centrifugal wind due to the fan effect of the side surfaces of the claws of the pole core is not generated, and interference noise from centrifugal wind and projections and recessions of the teeth is prevented. Furthermore, a relative

rotation of the bobbin to the pole core is prevented, so that the exciting coil is prevented from being disconnected and short-circuited.

Brief description of the figures

Figure 1 is a schematic diagram showing a bobbin and a spacer used in an application example of a rotor for an alternating-current generator for a vehicle of the present invention. Figure 2 is an oblique view showing the spacer of Figure 1. Figure 3 is a cross section along III-III of Figure 1. Figure 4 is a cross section showing a state in which an exciting coil is wound on the bobbin. Figure 5 is a cross section showing a state in which one pole core is mounted in the bobbin. Figure 6 is a cross section showing a state in which a pair of pole cores are mounted in the bobbin. Figure 7 is an oblique view showing a state in which one pole core is mounted in the bobbin. Figure 8 is an oblique view showing a state in which a pair of pole cores are mounted in the bobbin. Figure 9 is a cross section showing the main parts of an alternating-current generator for a vehicle. Figure 10 is a cross section in the direction of arrow P in Figure 9. Figures 11 and 12 are a schematic diagram and a cross section showing a bobbin and a spacer used in another application example of a rotor for an alternating-current generator for a vehicle of the present invention.

1, 1' Pole cores
1-p, 1-p' Claws
2 Stator
2-a' Teeth
5 Exciting coil
20 Bobbin
21 Connecting part
22 Hinge part
30 Spacer
30-a Concave part
30-b Curved surface part
30-c Housing part
30-d Concave part

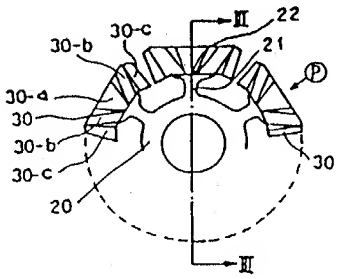

Figure 1. A schematic diagram showing a bobbin and a spacer

Key:
	20	Bobbin
	21	Connecting part
	30	Spacer
	30-a	Concave part
	30-b	Curved surface part
	30-c	Housing part

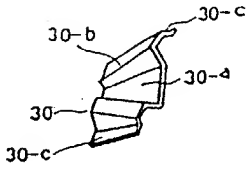

Figure 2. An oblique view showing the spacer

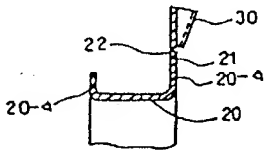

Figure 3. A cross section across III-III of Figure 1

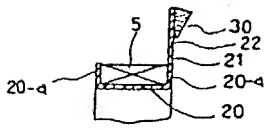

Figure 4. A cross section showing a state in which an exciting coil is wound on the bobbin

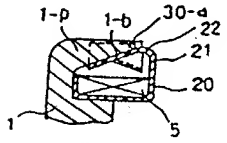

Figure 5. A cross section showing a state in which one pole core is mounted in the bobbin

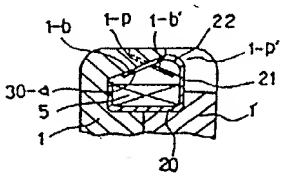

Figure 6. A cross section showing a state in which a pair of pole cores are mounted in the bobbin

Key:	1, 1'	Pole cores
	1-b, 1-b'	Back faces
	1-p, 1-p'	Claws
	5	Exciting coil

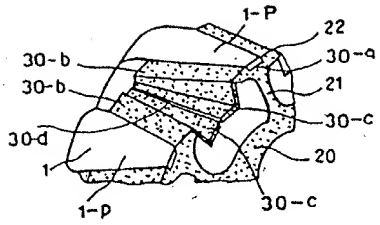

Figure 7. An oblique view showing a state in which one pole core is mounted in the bobbin

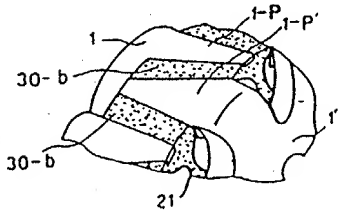

Figure 8. An oblique view showing a state in which a pair of pole cores are mounted in the bobbin

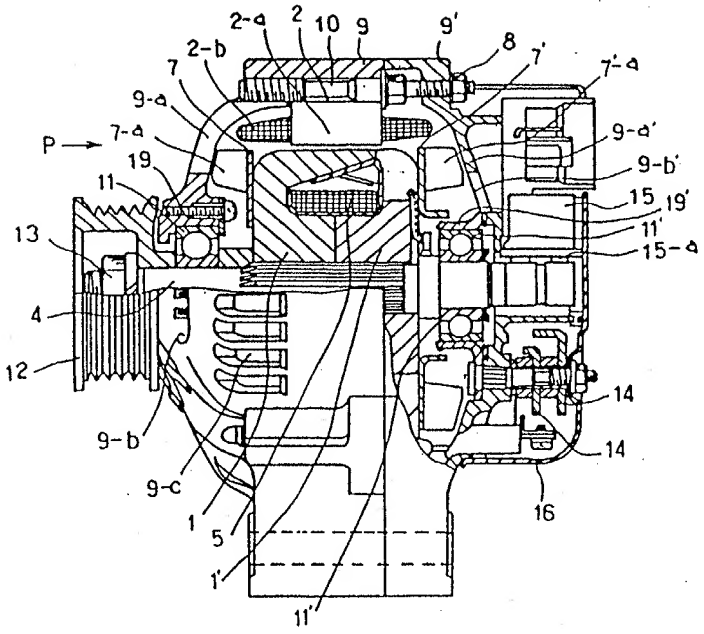

Figure 9. A cross section showing the main parts of an alternating-current generator

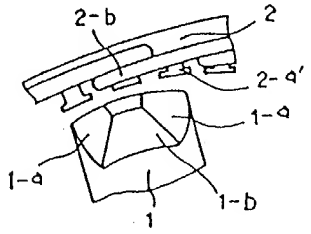

Figure 10. A cross section in the direction of arrow P in Figure 9

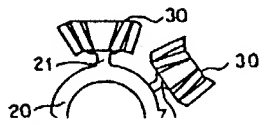

Figure 11: A schematic diagram showing a bobbin and a spacer (another application example)

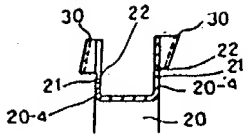

Figure 12: A cross section showing a bobbin and a spacer (another application example)